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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/784,800	02/15/2001	Joseph S. Gordon	064441.0207	2724
31625	7590	12/19/2005	EXAMINER	
BAKER BOTTS L.L.P. PATENT DEPARTMENT 98 SAN JACINTO BLVD., SUITE 1500 AUSTIN, TX 78701-4039			CHANG, AUDREY Y	
			ART UNIT	PAPER NUMBER
			2872	

DATE MAILED: 12/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	09/784,800		GORDON ET AL.	
	Examiner		Art Unit	
	Audrey Y. Chang		2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7,9-14,16-24 and 26-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7,9-14,16-24 and 26-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on October 17, 2005, which has been entered into the file.
- By this amendment, the applicant has amended claims 9, 12, 19, 21 and 29.
- Claims 7, 9-14, 16-24, and 26-30 remain pending in this application.

Response to Amendment

1. The amendment filed on **February 9, 2005** is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

The phrase "light is transmitted ... through the opening through the thin film and onto the wafer ..." recited in **amended claims 7, 17 and 26**, the phrase "*wherein a portion of the transmitted (or projected) light is diffracted by the photomask opening and passes through the thin film at the angle of incidence greater than zero, the transmission of such portion of light passing through the thin film at the angle of incidence greater than zero being maximize due to the optical thickness of the thin film produces an increased resolution of the projected image on the wafer*" recited in **amended claims 7 and 26.**, and the phrase "*light transmitted ... through opening in the photomask through the thin film onto the wafer ... a portion of the transmitted light is diffracted by the photomask opening and passes through the thin film as off-axis light the approximate 99% transmission of such off-axis light produces an increased resolution of the image of the opening projected onto the wafer*" recited in **amended claim 17**

The specification **fails** to teach that the transmitted light passes through the photomask, then through the thin film and then to the wafer, and **fails** to teach the light diffracted by the photomask or the

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projected image generated from the photomask will pass the thin film again and a *diffracted portion* of the light passes through at an incident angle greater than zero is *maximized* due to the optical thickness of the thin film. The specification also **fails** to provide support for the diffracted light from the photomask passes through the thin film as off-axis light and 99% of the off-axis light increase the resolution of the image. The specification explicitly teaches that the pellicle film is *on* the photomask wherein the light will incident on the *pellicle* first before it been diffracted by the photomask as demonstrated by Figure 3 of the instant application.

The applicant is respectfully noted, although the specification loosely discloses that the pellicle may be placed between the photomask and an imaging lens, (specification page 10 lines 15-17), this phrase does not give the support for *“wherein a portion of the transmitted (or projected) light is diffracted by the photomask opening and passes through the thin film at the angle of incidence greater than zero, the transmission of such portion of light passing through the thin film at the angle of incidence greater than zero being maximize due to the optical thickness of the thin film produces an increased resolution of the projected image on the wafer”* and/or *“light transmitted ... through opening in the photomask through the thin film onto the wafer ... a portion of the transmitted light is diffracted by the photomask opening and passes through the thin film as off-axis light the approximate 99% transmission of such off-axis light produces an increased resolution of the image of the opening projected onto the wafer”* as claimed in the claims.

Since the specification fails to give an explicitly relationship between the pellicle, the photomask, the imaging lens and the wafer. And the specification fails to teach that the thickness of the pellicle is designed to maximize the diffracted light from the photomask toward the wafer. A simple language of placing the pellicle between the photomask and the imaging lens (without explicitly states the location of the imaging lens to the least) WILL NOT be enough to support the “maximization of diffracted light portion from the photomask through the pellicle to the wafer” or

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“99% of the transmission of the off-axis light produces an increased resolution of image”. The imaging lens is not even in the claims and is not disclosed in the specification either. The applicant is respectfully noted that the lens (47, Figure 1) in the cited Nose patent can be regarded as “imaging lens” for the pellicle to be placed between the photomask and the imaging lens.

Furthermore, the applicant is also respectfully noted that in the same paragraph of the specification (page 10) there is an explicitly teaching of having the pellicle “covers” the photomask for protecting it from dust. If one reads the paragraph in page 10 of the specification with the explicitly disclosure of the pellicle being formed on the photomask as shown in Figure 3, one would not be able to deduce that the diffracted light from the photomask is capable of being transmitted through the pellicle and the non-zero incident of the diffracted light on the pellicle will be maximized and the light diffracted from the photomask will be off-axis light passes through the pellicle with 99% of the off-axis light increases the resolution of image”.

Furthermore, since the pellicle has only specific transmission peaks at specific wavelength and specific angles of incidence, to simply placing the pellicle between the photomask and the imaging lens will not be able to meet the sophisticated condition to produce the maximum off-axis transmission for the diffracted light as claimed in the claims.

There simply are not enough explicit disclosures and supports for the claim languages of claims 7, 17 and 26.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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3. **Claims 7, 9-14, 16-24 and 26-30 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The reasons for rejection based on *newly added matters* are set forth in the paragraph above.

4. **Claims 7, 9-14, 16, 17-24 and 26-30 are rejected under 35 U.S.C. 112, first paragraph**, as containing subject matter which was not described in the specification in such a way as to **enable** one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The phrase “the transmission of such portion of light ... produce an *increased resolution* of the projected image on the wafer” recited in claim 7 and the phrase “projection of the diffracted portion of light ... *increase the resolution* of the image” recited in claim 26 are not enabled by the disclosure since the *resolution* of the projected image is determined by the **Rayleigh’s criterion**, namely if the angular separation between two image points are greater than $1.22(L/d)$, with L being the wavelength and d being the size of the opening the two points can be resolved. The *resolution* of a projected image therefore is **implicitly** defined at least in part by the *size* or spatial information of the *opening* of the *photomask*, but not by the projection of certain portion of the light. To the most the projection of the light will only increase the *intensity* of the image but not the resolution.

The phrase “wherein a portion of the transmitted (or projected) light is diffracted by the photomask opening and passes through the thin film at the angle of incidence” recited in **claims 7 and 26** and the phrase “light transmitted ... through opening in the photomask through the thin film onto the wafer ... a portion of the transmitted light is diffracted by the photomask opening and passes through the thin film” recited in **claim 17** are not enable by the disclosure of the structure of the pellicle with the

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frame in associated with the photomask as shown in Figure 3. In this structure, the light passes through the thin film first then to the photomask. The light diffracted by the photomask **will not** pass through the thin film again rather the diffracted light will proceed to the wafer so that the image information of the photomask can be formed on the wafer. **The specification and the claims therefore fails** to teach how to form such pellicle with the frame and thin film with respect to photomask to enable the claimed light passages.

Claim 17 recites that the “amorphous fluoropolymer thin film operable to transmit approximately ninety-nine percent (99%) of off-axis light at a particular wavelength”, however the specification fails to disclose such. The specification **only** enables the off-axis light at *certain degrees of incidence* to have transmission approximates 99% of the light but not to all of the off-axis lights or not to any off-axis light at *any* incident angle.

Claims 9-14, 16, 18-25 and 27-30 inherit the rejections from their respective based claim.

Claim Objections

5. **Claims 9, 12, 19, 21, 29 are objected to because of the following informalities:**

(2). It is not understandable how could the thin film having thickness that gives peak transmission for **off axis** or **non-normal incident light** but is able to give peak transmission for wavelength that is *1 nanometer* above the “particular wavelength”. It is impossible to have this kind of accuracy for light having wavelength differing only in one nanometer to give so different transmission property.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 7-14, 16-24 and 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Nose et al (PN. 5,742,386) in view of the patents issued to Hayano et al (PN. 4,966,457) and Fukumitsu et al (PN. 4,657,805).

Nose et al teaches an *exposure system* for detecting foreign matter AND exposing information on the photomask on photosensitive material coated on a wafer, (please see column 8, lines 1-7), that is comprised of a *pellicle* (50) having a *thin film*, fixed to a *pellicle frame* (51), made of *aluminum*, in order to cover a *pattern* portion on a *photomask* (52), (please see Figures 1, 6 and 9, column 1, lines 44-54 and column 4). Nose et al teaches that the pellicle with the thin film, having certain optical thickness, is capable of making the peaks of transmission of the light with incident angles at *off axis* (such as 10° , 30° , 60° as shown in Figure 7) to be at *100 percent*, (please see the *100 percent transmission of the off-axis light in Figures 7 and 8*). This pellicle with thin film therefore is capable of *maximizing* the transmission of light at *off axis* at an exposure wavelength, which serves as the particular wavelength.

With regard to the feature such that the *optical thickness* of the pellicle film operable to maximize transmission of an exposure wavelength at an angle of incidence greater than zero, and the thickness being equal to *one-quarter or less than one quarter of the exposure (or the particular) wavelength* plus a design thickness for the design thickness being the thickness of the film allows to produce a transmission peak for normal incidence.

Nose et al teaches that the pellicle film, with definite thickness, enables the incident light with exposure wavelength to achieve transmittance peaks (100 percent transmittance) for incident angle *greater than zero*, (please see Figures 7 and 8). Nose et al further teaches that by varying the optical thickness of the pellicle film the maximized transmittance of the light of an exposure wavelength can be

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achieved at **different** incident angles greater than zero as shown in Figure 7. Although this reference does not teach **explicitly** that the film thickness is equal to one-quarter or less than one quarter of the exposure wavelength plus a design thickness for the design thickness being the thickness of the film allows to produce a transmission peak for normal incidence, but such feature is **implicitly** met for the reasons state as follows. It is known in the art that the maximum transmittance of the pellicle film for normal incident is determined by the equation: $m * \lambda = (2 * n) * d$, with m being an integer, λ being the exposure wavelength, n being the refractive index of the pellicle film and d being the thickness of the film. It can be easily calculated that for $n=1.5$ and the exposure wavelength being $0.488 \mu\text{m}$ the design thickness d for normal incidence is $0.813 \mu\text{m}$, which means the actual thickness $0.86 \mu\text{m}$ is being greater than the design thickness by less than one quarter of the exposure wavelength, (one quarter of the exposure wavelength is $0.122 \mu\text{m}$). **One skilled in the art** would understand that the maximum or peak transmission of the light is determined by the *interference theory*. By teaching the peak transmission occurs at incident angle *greater than zero or non-normal incident angle*, according to the interference theory, the thickness of the film taught by Nose et al **must be different** from the thickness of the film that gives peak transmission at normal incident angle. In order for the peak transmission, (for non-normal incident angle) to be **at the same exposure wavelength** as for normal incident, the thickness of the film has to be varied from the thickness for normal incident. It is a simple mathematical calculation and one skilled in the art would understand such.

With regard to the amended features of “the thin film formed to cooperate with a photomask including an *opening* such that when light is transmitted at the particular wavelength *through* the opening in the *photomask*, *through* the thin film *onto* the wafer to project an image of the photomap opening onto the wafer” is completely wrong and not supported by the specification. This feature, namely, the order of the light therefore cannot be further examined here since it is in contradiction to the lithographic process.

With regard to the features concerning the *lithographic process* of forming the opening of the photomask onto a wafer, Nose et al teaches that the pellicle (50) is formed to *cooperate* with a *photomask* (52) as shown in Figures 1 and 3). Nose et al further teaches the *photomask with the protective pellicle* is used in a *semiconductor device manufacturing apparatus*, or lithographic exposure apparatus, (please see Figure 9) wherein the image information, such as **IC pattern**, (please see column 1, line 49 and column 2, line 24, the explicitly teaching of IC pattern on the photomask) or **reticle pattern** (108, Figure 9) **placed** in the photomask is **transferred** onto a *wafer* (1110). It is **implicitly** true that the photomask has “opening” and has spatial information, i.e. physical pattern, that is *transferred* to the wafer to manufacture the semiconductor device, (please see Figure 9, column 1 lines 13-21 and column 7, lines 7-31). The IC or integrated circuit pattern **MUST** have openings otherwise no electric circuit will be created. Also by nature of the “photomask”, a photomask **MUST** have an opening otherwise no light will be passing through the photomask and no image can be projected onto the wafer. The opening associated with the IC pattern or the reticle pattern on the photomask cooperates to produce and define the image of the pattern being formed on the wafer and **according to the Rayleigh’s criterion which means the opening in the photomask will diffract the light beam**, (explained in paragraph above) the size of the opening **implicitly** determines at least partially the resolution of the projected image. Nose et al teaches explicitly that the apparatus is not just for inspecting foreign matters in the photomask *but it is* also and *ultimately* a lithographic exposure means for forming IC pattern on the wafer, (please see the explicitly teachings in column 3, lines 25-30, Figure 11, column 8, lines 1-7). In Figures 7 and 8, Nose et al teaches explicitly that the *thin film* will cause the incident light to have maximized transmission at certain off-axis incident angles, it is therefore either implicitly true or obvious modification to one skilled in the art to use light incident at these off-axis incident angles on the thin film pellicle and the light is transmitted by the thin film to the photomask and to expose and transfer the IC pattern on the photomask to the wafer for the benefit of maximizing the intensity of the exposure light to efficiently form the pattern on the wafer.

With regard to the features concerning *“light transmitted through opening in photomask through thin film and onto the wafer ... wherein a portion of the transmitted light is diffracted by the photomask opening and passes through the thin film at the angle incidence greater than zero being maximized due to the optical thickness of the thin film produces an increased resolution of the projected image”* as recited in **claims 7 and 26**, and the features *“light transmitted ... through opening in the photomask through the thin film onto the wafer ... a portion of the transmitted light is diffracted by the photomask opening and passes through the thin film as off-axis light the approximate 99% transmission of such off-axis light produces an increased resolution of the image of the opening projected onto the wafer”* as recited in **claim 17**, they are rejected under 35 USC 112, first paragraph, for the reasons stated above. **Nose** teaches that the pellicle having the pellicle thin film coupled to a frame can be designed to cover the photomask from both sides of the photomask, (please see Figures 1 and 9). However it does not teach explicitly that the thin film (50) is placed on both sides of the photomask. **Hayano et al** in the same field of endeavor teaches a pellicle for protecting a photomask wherein the pellicle thin film has maximum transmission peaks for light incident at angles greater than zero, (please see Figures 1 and 2) wherein the pellicle thin films (1 and 1a) can be formed with a frame such that the pellicle thin film is placed at **both** sides of the photomask (3, please see column 7, lines 44-49). It would then have been obvious to one skilled in the art to apply the teachings of **Hayano et al** to modify the pellicle of **Nose** to make the pellicle thin films at both sides of photomask to enclose the photomask to provide better protection of it from dust and to enhance the light transmitted from photomask as desired. It is implicitly true by having the pellicle thin film placed at the lower surface of the photomask, the light diffracted by the photomask will then pass through the pellicle thin film.

With regard to the features concerning the thin film produces a peak in transmission for normal incidence at a wavelength between one nanometer to twenty nanometer above the particular wavelength, this feature is implicitly met by the interference condition of the thin film since for the thickness of 0.86

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micron the maximum peak occurs for light of 488 nm wavelength at 10 degrees of incident light, then for the same thickness of the thin film, the maximum peak of transmission for normal incident will occur of light having wavelength close to 484 nm which is within the range.

This reference has met all the limitations of the claims with the exception that it does not teach *explicitly* that the pellicle film is an amorphous fluoropolymers. **Fukumitsu et al** in the same field of endeavor teaches a thin film pellicle for a photomask wherein the thin film is made of amorphous fluoropolymers that has a good transmittance in the ultraviolet and visible wavelength ranges, (please see the abstract). It would then have been obvious to one skilled in the art to apply the teachings of Fukumitsu et al to make the thin film pellicle of Nose et al with amorphous fluoropolymers for the benefit of using a suitable material that has good transmittance property to make the pellicle. Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claims 10-14, 20-24 and 27-30, the Nose et al reference does not teach explicitly to include anti-reflective coatings on the pellicle. **Fukumitsu et al** in the same field of endeavor teaches a dust cover for photomask reticle wherein the dust cover comprises a thin film (1) and an anti-reflective coating (3) on the top and bottom surfaces of the thin film, (please see Figures 1 and 2). Fukumitsu et al teaches that the anti-reflective coating has a thickness of about one quarter of the design wavelength and has a refractive index that is a square root of the refractive index of the thin film (1), which is therefore different from the refractive index of the thin film, (please see column 5, lines 8-50). It would then have been obvious to one skilled in the art to apply the teachings of Fukumitsu et al to add anti-reflective coating on top and bottom of the thin film pellicle of Nose et al for the benefit of improving the transmittance and reduced the unwanted reflection of light from the pellicle.

With regard to claim 16, Nose et al teaches that the thickness of the thin film is about 0.86 μ m, or 860 nanometers and Nose et al teaches that the exposure wavelength is about 0.488 μ m or 488 nanometer,

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(please see Figure 7), but it does not teach explicitly that the exposure wavelength is between the 248 and 436 nm. However the specification fails to teach the criticality of having these particular wavelengths would overcome any problem in the prior art and since Nose et al teaches that by changing the thickness of the thin film the peaks of the transmission may be changed, it is therefore obvious modifications to one skilled in the art to design the pellicle thin film to have the desired peaks to facilitate different exposure wavelengths for the benefits of utilizing it in optical systems operated with different wavelength sources as desired.

Response to Arguments

8. Applicant's arguments filed October 17, 2005 have been fully considered but they are not persuasive. The newly amended claims have been fully considered and they are rejected for the reasons stated above.

9. The applicant is respectfully noted that the arguments concerning the cited Nose reference discloses an apparatus for detecting foreign matters on a substrate is not correct, since Nose teaches explicitly about photolithographic process as shown in Figure 7.

10. Applicant's arguments concerning the new matters rejections have been fully responded in the paragraphs above. The applicant is respectfully reminded that claimed features need to have fully support from the specification and must have full disclosure in the specification. The disclosure of having pellicle placed between imaging lens and photomask simply does not give the support and disclosure for the features claimed in the claims as explicitly stated above. The specification further fails to provide the enable disclosure for achieving the claimed features.

Contact Information

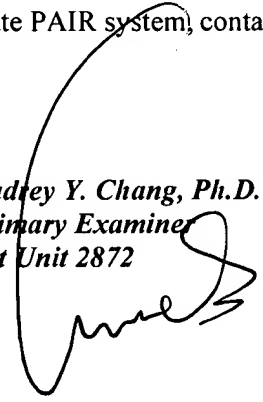
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Audrey Y. Chang, Ph.D.
Primary Examiner
Art Unit 2872



A. Chang, Ph.D.